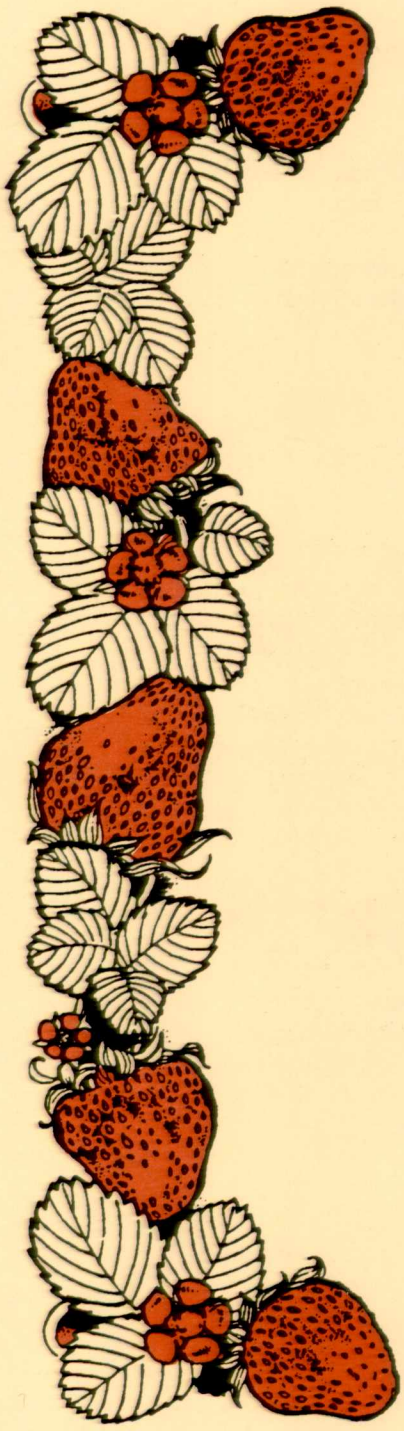
"Circular (University of Alaska, Fairbanks. Agricultural Experiment Station)"



Growing Everbearing Strawberries

as Annuals in Alaska

A Technique for High Yields

300G-00235

COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF ALASKA FAIRBANKS & USDA Cooperating

Agricultural Experiment Station
School of Agriculture
and
Land Resources Management
University of Alaska Fairbanks

Circular 35

by
Donald H. Dinkel, Patricia J. Wagner, and Grant E.M. Matheke

Revised April 1991
by
Grant E.M. Matheke, Patricia J. Wagner, and Patricia S. Holloway

Reprinted by
Cooperative Extension Service
University of Alaska Fairbanks
and U.S.D.A. Cooperating

Publication 300C-00235

for further information
Wayne Vandre
Horticulture Specialist
Cooperative Extension Service
University of Alaska Fairbanks

GROWING EVERBEARING STRAWBERRIES IN ALASKA

Introduction

A technique for growing high-yielding, everbearing strawberries with clear polyethylene (plastic) mulch and row covers has been developed at the Agricultural and Forestry Experiment Station at Fairbanks. This technique eliminates the long delay from planting to fruiting that occurs with other culture systems and it has created an interest in commercial production and an increased home-garden effort in Alaska.

The production system involves planting nursery plants each season as early as possible through clear polyethylene mulch, using row covers for the early part of the season. Using this technique, harvest begins about July 15 and extends until freeze-up, compared to a production season from about July 10 to July 28 for hardy types of strawberries such as Toklat or Pioneer. This system produces clean fruit, easy to pick and relatively free from fruit rot. The harvest season can be extended in the fall by again using the row covers for frost protection.

Table 1
Yields of several everbearing varieties of strawberries grown through a clear polyethylene mulch and with polyethylene row covers at Fairbanks, Alaska.

	Yield (lb/ft^2)							
Variety	1977	1978	1979	1980	1981	1983	1984	Average fruit weight (oz)
Quinault	0.92	1.01	1.29	0.71	0.81	0.68	0.49	0.29
Ozark Beauty	—	0.99	—	—	—	—	—	0.31
Ogallala	—	—	1.15	—	—	—	—	0.23
Superfection	—	—	0.71	—	—	—	—	0.35
Streamliner	—	—	0.25	—	—	—	—	0.35
Hecker	—	—	—	0.84	0.71	0.49	0.33	0.36
Brighton	—	—	—	0.28	—	—	—	0.54
Fern	—	—	—	—	—	—	0.28	0.42
Tillicum	—	—	—	—	—	0.47	0.17	0.24

Yields were based on a bed size of 30 inches by 10 feet containing 30 plants. About 8,712 linear feet of these beds could be grown in an acre.

Figure 1. Quinault strawberries produced by the row-cover system. Heavy fruit load on the plants is seen at the top of the picture.

Table 1 shows yields obtained at Fairbanks, Alaska, from 1977 to 1984. To date, Quinault (Figure 1) has been the highest-yielding variety grown. The average yield for Quinault from 1977 to 1989 was 0.84 lb per square foot. This yield compares to 0.16 lb per square foot from established beds of Toklat strawberries. Hecker (Table 1) has produced lower average yields (0.59 lb per square foot) than Quinault under this system, but is preferred by some because it has firmer fruit that improves its keeping quality.

Production System

A commercial grower should order strawberry plants from nurseries in large quantities in order to keep costs down. Home gardeners can obtain small quantities from local sources and some retail catalogs, but at a much higher cost. When possible, a shipping date should be specified so that plants arrive in late April for planting in mid-May. When the strawberry plants are received from the supplier, hold them until planting time in a manner that will promote vigorous growth after transplanting. Plants usually arrive from the nursery in bundles of 25. Place bundles upright on 1 to 2 inches of local peat in a plastic tub and cover exposed roots with peat. Approximately 500 plants can be packed into a tub 30 inches square. Keep plants in a greenhouse or heated cold frame with daytime temperatures near 70 °F until planting time. This treatment allows plants to get an earlier start and they will be larger and easier to transplant. Plants should be watered periodically to keep them moist. Fertilize with a liquid fertilizer solution (2 tablespoons of 9–45–15 per gallon of water) about 10 days and again 1 day

before transplanting. To minimize transplant shock, harden off plants in a cold frame for 5 days before transplanting. If possible, plants should not be held in tubs longer than three weeks.

As early as possible in the spring, plots should be fertilized, rototilled and harrowed. Our standard practice has been to apply 1,500 pounds per acre of 10–20–20 fertilizer. However, growers at other sites should have their soil tested by the Cooperative Extension Service and base their fertilizer rate on Extension Service recommendations. At the test plots at the Agricultural and Forestry Experiment Station, a double row of drip irrigation tubing is laid above ground on each bed. If an herbicide will be used, it should be applied prior to laying the plastic mulch and row covers.

The row-cover system consists of a 4-foot wide sheet of 1.5-mil clear polyethylene for the mulch and two 3-foot wide, 1.5-mil clear polyethylene sheets for the side covers. At the Agricultural and Forestry Experiment Station, we modified a commercial mulch-laying machine to lay the three sheets in one operation, with the 4-foot wide sheet laid on the bottom, and one 3-foot sheet even with each edge of the 4-foot sheet. About 6 inches of plastic on each edge must be covered with soil to anchor the sheets, leaving the inner edge of each of the 3-foot sheets free. Wire hoops are then inserted inside, and the side sheets are brought up over the hoops to form a tunnel (Figure 2). Twelve-gauge galvanized construction wire, cut to 6-foot lengths makes ideal hoops. This allows for one foot of wire on each end to be inserted in the ground. When placed in the beds, the wire makes an arch 30 inches wide and 18 inches

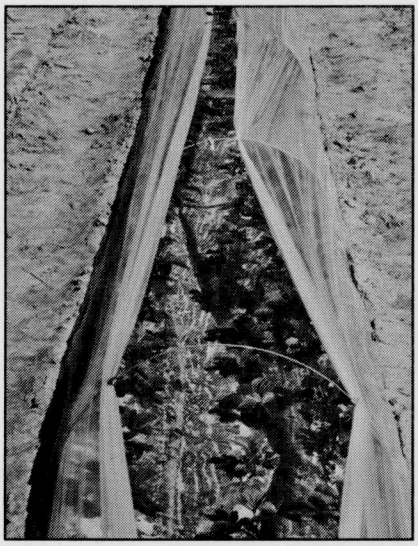


Figure 2. Young strawberry plants growing in row covers. Row covers are partially open to show 12-guage-wire hoops, clothespin attachments and spacing of plants.

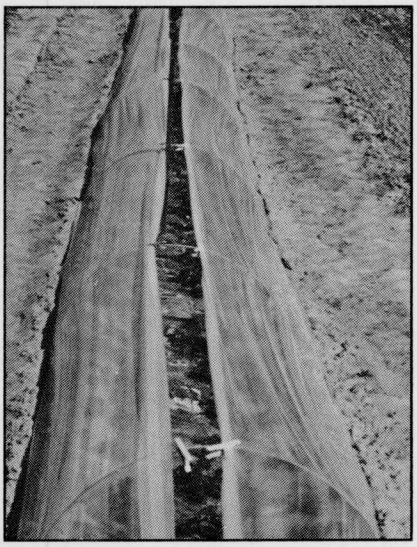


Figure 3. Row covers over strawberries showing raised sides with a small opening left to prevent excessive heat buildup. Sides should be left up until flowering, when a larger opening will be necessary for good insect pollination.

high. Placing all hoops at the same height along the row produces a more wind-resistant cover than if the height and width varies significantly. Hoops are placed a 5-foot intervals along the row. Row covers can then be fastened with clothespins at any height on the wire. Side covers are rolled all the way down until the plants are placed in the beds. Then the sides are put up with only a 1- to 2-inch opening at the top for the first 2 to 3 weeks (Figure 3).

Mulch trials (Table 2) have indicated that yields are superior when clear plastic mulch and row covers are used. However, if you wish to avoid using herbicides and reduce hand weeding, you may want to use black plastic mulch with clear plastic row covers. The yield reduction caused by using black plastic mulch depends upon weather conditions during the growing season. The reduction ranged from 9% to 32% during this study (Table 2).

Table 2
Yields of Quinault strawberries grown through various mulches with clear polyethylene row covers.

	Yield (lb/ft²)		
Mulch	**1987**	**1988**	**1989**
Clear Polyethylene	0.76a†	1.03a	1.11a
Black Polyethylene	0.52b	0.94a	0.86b
Black/White Polyethylene*	0.49b	0.70b	0.79b
Black Spray On**	0.48b	0.73b	0.69b
White/Black Polyethylene+	0.43b	0.76b	0.54b
Dupont Landscape Fabric	0.41b	0.70b	0.61b
Yield Reduction, Black vs Clear Mulch	31.7%	8.9%	23.0%

† Numbers in columns with different letters are significantly different (Waller-Duncan K-ratio t-test, $P<0.05$).

* Polyethylene mulch with one black side and one reflective white side applied with the black side up.

** Liquid black latex mulch sprayed directly on the soil surface where it hardens into a thin asphalt like covering.

\+ Polyethylene mulch with one black side and one reflective white side applied with the white side up.

In the summer of 1990, we tested a new polyethylene mulch, IRT-76[1] on sweet corn. IRT-76 was designed to control weeds and provide soil warming comparable to clear plastic mulch. The IRT-76 mulch was effective in controlling weeds and soil temperatures. Sweet corn growth and yields were significantly greater using IRT-76 than the black mulch treatments and only slightly below the clear mulch treatments. (G.E.M. Matheke, P.S. Holloway and P.J. Wagner, 1991, *IRT-76 Polyethylene Mulch and Growth of Sweet Corn in Fairbanks, Alaska.* Research Progress Report, AFES, University of Alaska Fairbanks.) Growers may wish to experiment using IRT-76 or similar "thermally opaque" mulches in order to eliminate the need for herbicides.

Transplanted strawberries are placed 3 rows per bed in a diagonal arrangement so that about 30 plants can be placed in a 10-foot length. Each plant occupies about 1 square foot of space. Plant spacings greater than 1-foot per plant have resulted in decreased yields per unit area. A bulb planter is used to make planting holes (Figure 4). If an herbicide has been used, plant roots are dipped in a 10 percent (by weight) slurry of activated charcoal to reduce injury by contact with herbicide-treated soil. Individual plants are placed in each hole and soil filled in around the plant so that the crown of the strawberry is even with the surface of the soil and the roots adequately covered. Proper positioning of the crown is critical to the plant's survival. After transplanting, plants should be watered both from the top with a hose and water-breaker and from under the plastic mulch with the drip-irrigation system shown in Figure 4.

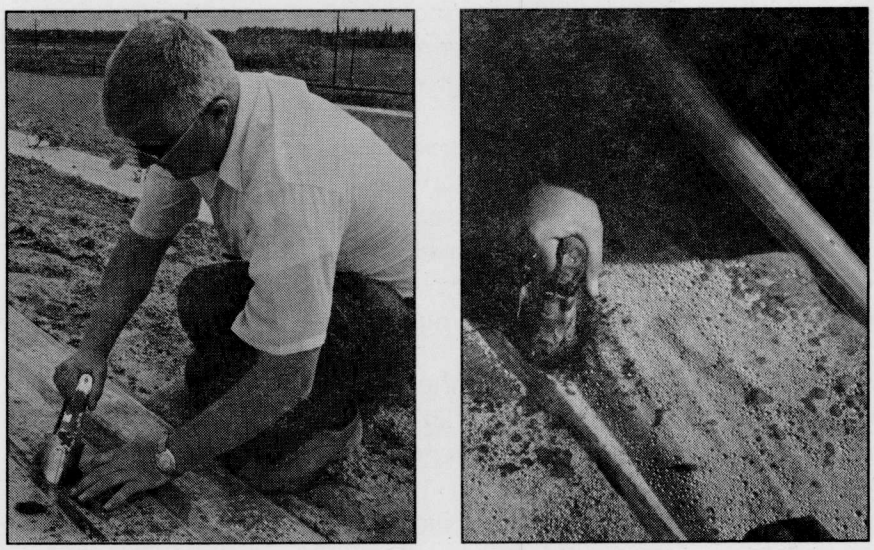


Figure 4. Holes being made in row cover system using a bulb planter. The black tube centered under the plastic is a drip irrigation hose. In these pictures only one hose is used, but with 3 rows of strawberries it is desirable to have two lines spaced between the 3 strawberry rows for more even irrigation. Note the sides rolled down to facilitate planting.

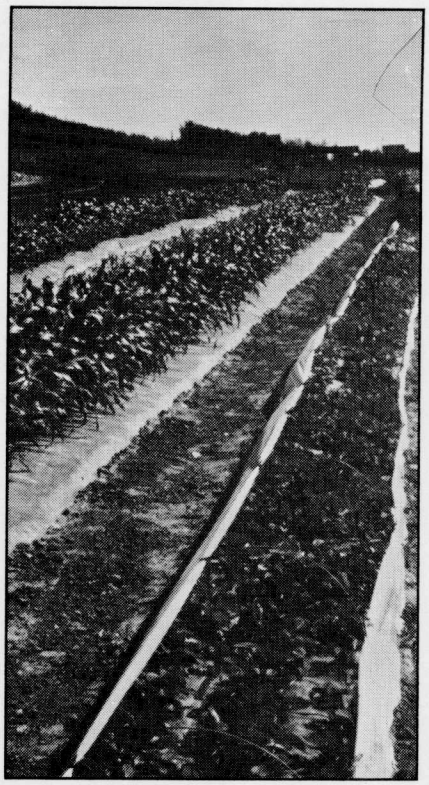


Figure 5. Strawberry beds with sides of row covers partially down so that bees and other insects can pollinate flowers.

When the plants begin to flower vigorously, it is necessary to lower the row cover (Figure 5) so that bees and other insects can pollinate the flowers. If the sides are left up a few inches, some protection is provided from the wind and a slightly warmer microclimate is obtained. Removing runner plants throughout the growing season is not necessary.

Moisture during the growing season should be supplied mostly through the drip-irrigation system; a small additional amount will be supplied by rain. An overhead sprinkler system could be used with the sides of the row covers down if the rows are level. It is important to keep the soil moist in order to obtain larger plant size and the highest yield. During warm weather, it is necessary to irrigate about once per week.

When plants begin to fruit heavily, they should be fertilized through the irrigation system using a soluble fertilizer. The best fertilizer practice has not been determined for this system. However, a complete soluble fertilizer such as 20–20–20, 9–35–15, or 10–20–10 applied during each irrigation after fruiting starts seems to be a reasonable practice. Either 0.25 lb of the 20–20–20, or 0.50 lb of 9–45–15 or 10–20–10 for every 100 square feet of bed will supply an equivalent amount of nitrogen. If water or fertilizer is inadequate, the fruit size and yield will drop dramatically.

From 1984 to 1986, fertilizer trials were carried out comparing the standard fertilizer practice (1500 lb per acre 10–20–20 prior to planting plus soluble fertilizer applied through the irrigation system) with the use of slow release fertilizers (Osmocote[2] and Ammonium Nitrate + N-serve[3]). The use of the slow release fertilizers did not result in any significant increase in yield.

This mulching system is proposed as an annual production scheme that requires replacing plants each year. However, we have had moderate success in overwintering the Quinault variety. Table 3 shows second-year yields obtained on beds of surviving strawberry plants.

Table 3
Yields from surviving Quinault strawberries the year following establishment (lb per square foot of bed).

1978	1979
0.33	0.47

Surviving plants have started producing about 3 weeks later with the yield less than half that of newly established beds. Mulching with straw or other material has improved winter survival slightly.

During long periods of wet weather there is a tendency for fruits to develop mold or rot. This has been controlled in test plots with the application of Ronilan[4] or Benlate[5] fungicide at recommended rates. In recent years, considerable fruit damage has been caused by thrips feeding on strawberry flowers. Thrips can be identified by blowing on strawberry flowers and looking for thin insects about $^1/_8$-inch long moving out onto the petals. Thrips can be controlled by spraying with Malathion at least three days prior to harvest.

Strawberry varieties best adapted to this system need to be relatively insensitive to day length in regard to flower initiation and production. Limited variety trails have been conducted in an effort to find a variety with a comparable yield to Quinault and superior keeping qualities.

Varieties that have proven unsatisfactory at Fairbanks are Aiko, Benton, Black Beauty, Hood, Ft. Laramie, Northwest, Pajaro, Rainier, Sequoia, Shasta, Shuksan and Solano.

In 1990 a three season variety trial was initiated comparing Quinault with several newer day-neutral varieties (Fern, Irvine, Mrak, Muir, Selva, Tribute, Tristar, and Yolo). Preliminary results indicate that Mrak and Tristar are nearly as productive as Quinault, have higher disease resistance and better keeping quality.

The success of this system is due to warmer soil temperatures achieved through use of the plastic mulch and a protected warmer environment within the overhead cover, resulting in a lengthening of the growing season. It is apparent that any technique which enhances these factors improves strawberry production. This technique has also been used successfully by growers in Southcentral Alaska where the growing season can be lengthened considerably. It would probably be successful in other Alaskan regions as well.

Sources

1 AEP Industries, 20 Knickerbocker Rd., Moonachie, NJ 07074

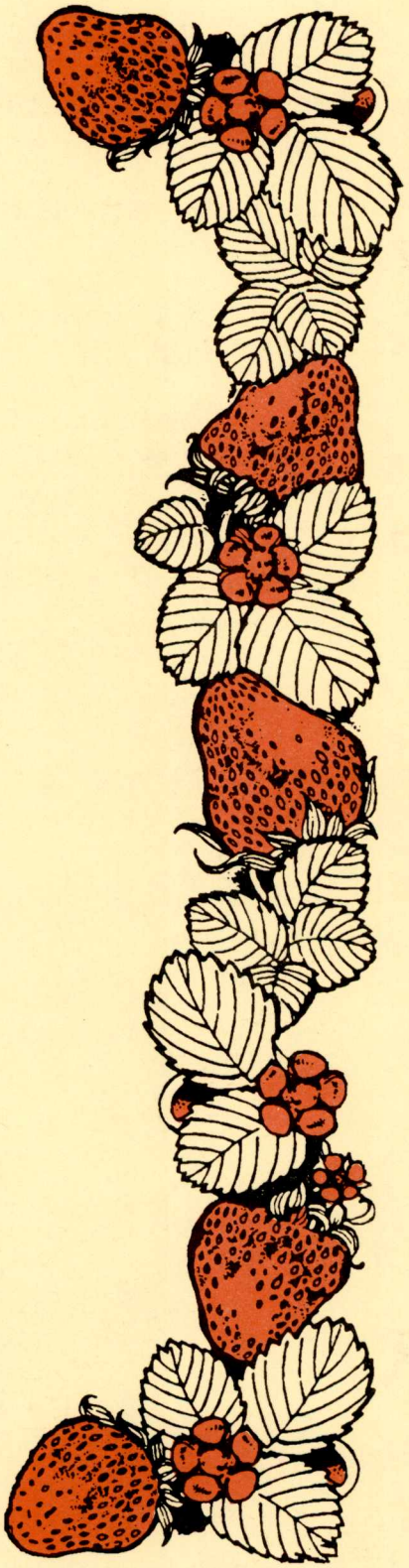
2 Sierra Chemical Company, 1001 Yosemite Dr., Milpitas, CA 93505

3 DowElanco, 4040 Vincennes Circle, Indianapolis, IN 46268-3030

4 BASF Corporation, P.O. Box 13528, Research Triangle Park, NC 27709-3528

5 E.I. du Pont de Nemours & Co., Inc., Walkers Mill, Barley Mill Plaza, P.O. Box 80038, Wilmington, DE 19880-0038

To simplify terminology, trade names of products or equipment may have been used in this publication. No endorsement of products or firms mentioned is intended, nor is criticism implied of those not mentioned.



353/1980/JVD January 1992